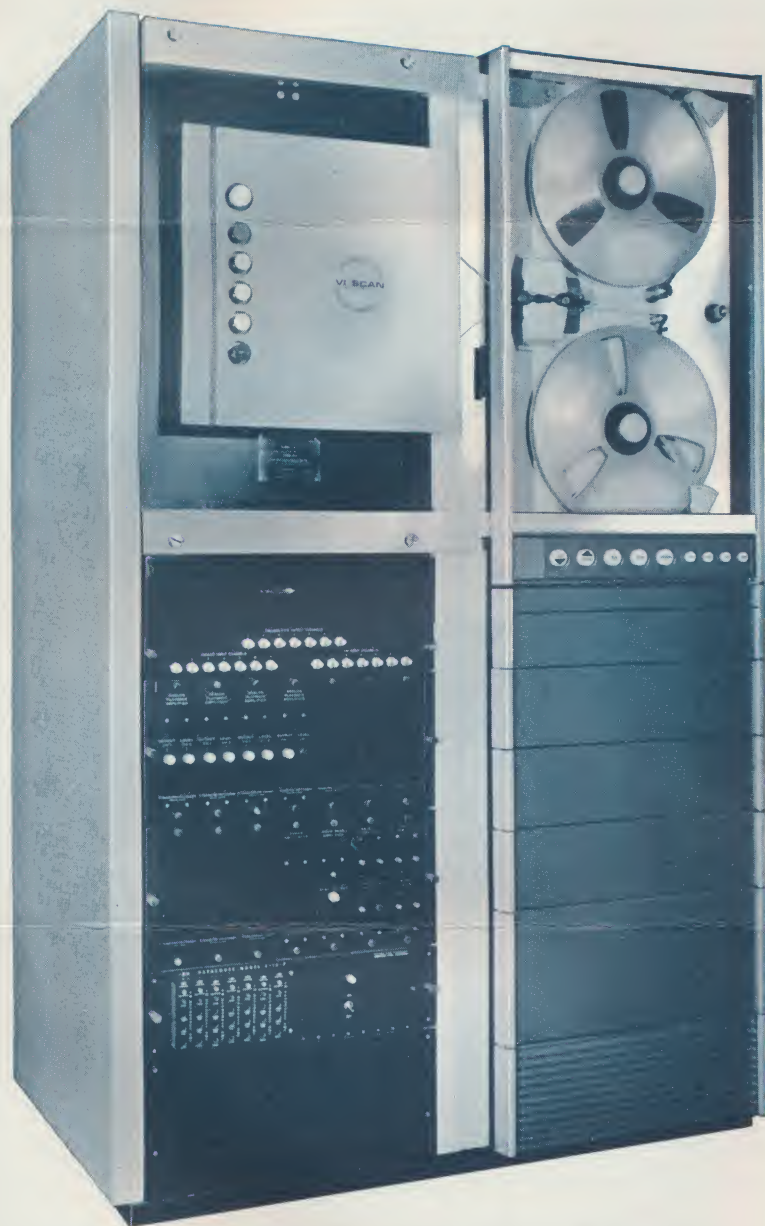


TECHNICAL SPECIFICATION—

VI/SCANTM III

*Military Designation: Recorder/Reproducer Set Signal Data AN/FSH-6 (XB-3)



for

- *Transient Analysis*
- *SNR Enhancement*
- *Correlation Analysis*
- *Speech Compression*

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VI/SCAN III
*is an IRIG
Compatible
System
Using the
VI/SCAN
Data
Processing
Technique.*

•

*Produced for Naval Research Laboratory under Contract Nonr-3906(00) (X)

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PATENT APPLIED FOR

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VI/SCAN_{TM} III System

GENERAL DESCRIPTION

VI/SCAN III is a complete record/reproduce system incorporating the unique data processing features of the VI/SCAN technique. It is capable of recording and reproducing up to 7 channels of information on 1/2 inch wide tape. Recording may be done in either Direct or FM mode - both compatible with IRIG analog tape standards per Document No. 106-60. Recorded tapes may be processed on a real time basis using a dual scan length headwheel. A pre-recorded IRIG format tape may also be processed.

Scan length is either 4" or 8" using the same headwheel. Adjustable arms permit changing the tape wrap angle and automatic switching is used to enable and/or disable heads used for each scan length. Three electrically changeable motor speeds provide 3 scanning rates. Equalizers, center frequency determining networks and low pass filters are plug-in modules. As each odd head stack enters the scan area a fast synchronizing pulse is automatically generated independent of the signal circuits.

SYSTEM CHARACTERISTICS

TEMPERATURE: Operating temperature range is 50° to 110° F.

SIZE & WEIGHT: 73-1/4" high x 47" wide x 28-1/4" deep--weighing 1,400 pounds for a 7-channel system.

SCANNING SUBSYSTEM CHARACTERISTICS

One dual scan length headwheel for 1/2 inch wide tape is provided. The following tabulation summarizes the scanning parameters it provides. The tape scan angle (mechanical angle defined by tangent points between wheel and tape) is adjustable over $\pm 10^\circ$.

All magnetic head stacks conform to IRIG Standards, i.e., azimuth angle is $90^\circ 00' \pm 1'$, gap scatter is ± 50 microinches, track location is $0.070" \pm 0.002"$ center-to-center, effective track width is $0.050" \pm 0.002"$. Separation of interlaced stacks is non-IRIG

Head and tape wear are virtually eliminated by providing a thin, stable air film for high speed operation. An electrically interlocked combination safety/dust cover encloses the headwheel assembly and shields operating personnel. Equipment construction conforms to the highest instrumentation standards. All critical points in the drive system use high precision permanently lubricated bearings, stainless steel shafts, tape guides, etc. MCRT's (Multi-Channel Rotary Transformers) are used for coupling electrical signals from the rotating head assembly.

VI/SCAN III incorporates a CEC Type GR-2800 IRIG Record/Reproduce System. The IRIG transport may be utilized independently of the scanning subsystem. When used for VI/SCAN processing, all control circuits are interlocked for proper start-up/shut-down sequences, correct tape tension and safety factors. All normal transport control modes are operable after the start-up cycle is completed.

POWER: Nominal 115 volts, 60 cps, single phase. Maximum requirement for 7-channel system is 1.5 kva. Regulated d.c. power is internally generated by solid state supplies. Circuit breakers are provided to safeguard all A.C. input lines.

to permit completely bidirectional operation; i.e., all stacks are spaced 2.00" apart. Head construction is all metal.

WOW & FLUTTER: Angular flutter of the headwheel, with tape either in motion or stopped, is 0.3% peak-to-peak maximum measured over a bandwidth from 0.5 to 300 cps.

CONTROLS: Fully interlocked manual controls are provided for the following functions: SCANNING SPEED, FORWARD, REVERSE, STOP, POWER ON, POWER OFF.

STANDARD HEADWHEEL PARAMETERS

VI/SCAN III is equipped with a dual scan length headwheel. Either a 4" scan length or an 8" scan length may be obtained by changing the tape wrap angle - controlled by two adjustable roller guides. The head-

wheel contains 4 pairs (odd and even) of headstacks. Two pair are automatically switched out when the 8" scan length is selected. Important headwheel parameters are summarized below:

TABLE I

Scan Length:	4" \pm 0.007"	8" \pm 0.007"
Scan Angle (nominal)	90°	180°
Distance From Record Head To Start of Scan: From Odd Stack From Even Stack	22-1/2" 21"	20-1/2" 19"
Scanning Direction	bi-directional	bi-directional
Scan Velocity* @ 225 RPM	60 ips @ 15 SPS**	- - - - -
Scan Velocity @ 450 RPM	120 ips @ 30 SPS	120 ips @ 15 SPS
Scan Velocity @ 900 RPM	- - - - -	240 ips @ 30 SPS

*For line frequency of 60 cps, tolerance of scanning velocity and rate is $\pm 0.1\%$. Scan Velocity is circumferential velocity of scanning; actual head-to-tape speed is Scan Velocity plus or minus (headwheel is bi-directional) linear tape speed. Scan Rate is the quotient of Scan Velocity and Scan Length. If the tape is in motion while it is being scanned, the effective scan rate may be computed as follows:

$$\text{Effective Scan Rate} = \frac{\text{Scan Velocity}}{\text{Scan Length}} \mp \frac{\text{Linear Tape Speed}}{\text{Scan Length}}$$

With the tape in motion, the number of times each segment of tape is scanned may be computed as follows:

$$\text{Number of Scans} = \frac{\text{Scan Velocity}}{\text{Tape Speed}} \pm 1$$

Where + sign is used when Scan Vector is in direction opposite to tape motion.

EXAMPLE: Tape Speed = 1-7/8 ips, Scan Velocity = 240 ips in direction of tape travel, Scan Length = 8".

$$\text{Effective Scan Rate} = 29.77 \text{ SPS}$$

$$\text{Number of Scans} = 121$$

**SPS = Scans per second.

SCANNING REPRODUCE ELECTRONICS

Modular construction is used throughout. With the exception of Nuviator coupling and output stages in the Video Post-Amplifier package, all electronic circuitry (video pre-amplifiers, regulated power supplies, etc.) is solid state. Standard input and output

(signal) connectors are BNC. Any combination of Direct or FM channels up to a maximum of seven can be provided. Speed/bandwidth changes are accomplished by changing plug-in networks in the FM demodulators (center frequency and low pass filter) and

analog post amplifiers (equalizers). Direct recording mode response is flat within ± 3 db

over the indicated bandwidth; response deviation is within ± 0.5 db for the FM mode.

TABLE II
STANDARD VI/SCAN III BANDWIDTH VERSUS SCANNING PARAMETERS

Scan Rate (Scans/Sec.)	SCAN LENGTHS			
	DIRECT MODE		FM MODE	
	4"	8"	4"	8"
15	2-120 KC	4-240 KC	DC-10 KC	DC-20 KC
30	4-240 KC	8-480 KC	DC-20 KC	DC-40 KC

HARMONIC DISTORTION: Direct Mode—When a 10 kc signal is recorded at 60 ips and scanned at any scanning rate; the third harmonic distortion will be less than 1% @ rated output level. FM Mode—Maximum total harmonic distortion is 1.5%.

OUTPUT LEVEL: Direct Mode—1 volt RMS into 1,000 ohms. FM Mode—1 volt RMS into 10,000 ohms.

OUTPUT IMPEDANCE: Direct Mode—Less than 100 ohms. FM Mode—Less than 1,000 ohms.

SIGNAL-TO-NOISE RATIO: Direct Mode—RMS Signal-to-RMS Noise ratio is at least 30 db when measured over the scanning bandwidth, worst case—with the amplitude of any signal frequency within the pass-

band used as a reference. FM Mode—RMS to RMS SNR at least 40 db at maximum input level.

FM SQUELCH CIRCUITRY: Each FM channel has a squelch circuit which automatically quiets whenever the carrier disappears, i.e., headwheel rotation is stopped or the channel is unrecorded. Separate threshold level adjustments are used for each channel. The level is automatically switched when the headwheel speed is changed.

SYNCH PULSE SYSTEM: A Synch Pulse is generated each time an odd (IRIG) head-stack enters the scan area. The pulse is positive going with a maximum rise time of 0.5 microseconds and a minimum peak amplitude of 8 volts. Output impedance is less than 100 ohms.

IRIG TRANSPORT SUBSYSTEM

The following abbreviated specifications apply when a CEC GR-2800 subsystem is supplied as part of VI/SCAN.

TAPE SPEEDS: 60, 30, 15, 7.5, 3.75, 1.875 ips; all $\pm 0.2\%$ at 60 cps line frequency.

TAPE CAPACITY: Accommodates NAB hub equipped reels up to 14" in diameter; either 1/2 inch or 1 inch wide tapes with either 1 mil or 1-1/2 mil polyester base.

WOW & FLUTTER: Less than 0.25% peak-to-peak over a 0.2 cps to 10 KC bandwidth at 60 ips.

START TIME: 3 seconds.

STOP TIME: 2 seconds.

TAPE MOTION CONTROLS: Fast Forward, Rewind, Stop, Reproduce, Record.

FREQUENCY RESPONSE: Direct Mode—100 cps to 100 KC at 60 ips; flat within ± 3 db. Proportionately lower at other tape speeds. FM Mode—DC to 10KC at 60 ips, flat within ± 0.5 db. Proportionately lower at other tape speeds.

SIGNAL-TO-NOISE RATIO: Direct Mode—At least 32 db RMS signal-to-RMS Noise. FM Mode—At least 40 db, RMS-RMS.

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